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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/824,692
Filing Date: April 15, 2004
Appellant(s): CHEN, MEI

Eduoard Garcia
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed May 29, 2008 appealing from the Office action mailed December 28, 2007.

(1) Real Party in Interest

A statement identifying by name the real party of in interest is contained in the brief.

(2) Related Appeals and Interferences

The Examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments after Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

Schultz et al., "Subpixel Motion Estimation for Super-Resolution Image Sequence Enhancement" published by the Journal of Visual Communication and Image Representation, v 9 n 1, pages 38-50, March 1998 ("Schultz").

U.S. Patent Number 7,088,773 issued to Paniconi et al. ("Paniconi").

U.S. Patent Number 6,269,175 issued to Hanna et al. ("Hanna").

Eren et al., "Robust, Object-Based High-Resolution Image Reconstruction from Low-Resolution Video," published by IEEE Transactions on Image Processing, v 6 n 10, October 1997 ("Eren").

(9) Grounds of Rejection

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 11, 16-17, 28-29, 32, 37, 42-43, 46, 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schultz et al., "Subpixel Motion Estimation for Super-Resolution Image Sequence Enhancement" published by the Journal of Visual

Communication and Image Representation, v 9 n 1, pages 38-50, March 1998 (“Schultz”) in view of U.S. Patent Number 7,088,773 issued to Paniconi et al. (“Paniconi”).

For claims 1, 28 and 42, Schultz discloses computing a respective motion map for each pairing of a reference image and a respective image neighboring the reference image in a sequence of base images, each motion map comprising a set of motion vectors mapping reference image pixels to respective neighboring image pixels. See for example page 38, which discloses that motion vectors are estimated between video frames, where the accuracy of the estimated motion fields has a direct influence on the quality of the high resolution video still image. See also page 45, figure 2, which shows a motion map comprising a set of motion vectors mapping reference image pixels to respective neighboring image pixels ("2. Estimate the subpixel-resolution motion vectors between [two low resolution video frames]," where the motion vectors collectively read on the claimed "motion map").

Schultz discloses the target image having a target resolution level and the base images having a base resolution level equal to or lower than the target resolution level (abstract, a high resolution video still image is estimated from several low resolution frames).

Schultz discloses assigning respective regions of a target image to motion classes based on the computed motion maps, in section 3 entitled “SUBPIXEL MOTION ESTIMATION TECHNIQUES,” which describes several methods of computing subpixel motion vectors for low resolution image pixels. For example, section 3.2 describes a

block matching motion estimation process that creates a motion map for objects that move independently in image sequences, and assigns respective regions of the target image to motion vectors based on the computed motion maps by determining separate motion fields (or "motion classes") for compact blocks (or "respective regions") in the image sequences. See page 42, first column, "the motion field is uniform over compact blocks of pixels."

In the claim language, the term "motion class" is broad enough to encompass a group of pixels that are assigned to a motion vector. As appellant noted on page 14 of his appeal brief, the "pertinent definition of 'class' is 'a group, set, or kind sharing common attributes.'"

Clearly, Schultz discloses assigning respective regions of a target image to motion classes, where each motion field (or motion vector) of a compact block is a motion class assigned to a respective region, because the pixels in the region "share the common attribute" of motion associated with the motion vector. Thus, Schultz implicitly describes the concept of motion classes when discussing motion estimation, but Schultz does not explicitly use the phrase "motion classes." As discussed below, Paniconi explicitly discloses the term "motion class."

Schultz discloses computing pixel values for the target image based on corresponding pixel value contributions from the base images selected in accordance with the motion fields assigned to the target image regions, see section 2 for example, entitled the Bayesian multiframe resolution enhancement. In other words, the super resolution images that are created by Schultz's method are created by pixel value

contributions from other images selected in accordance with the motion estimates assigned to the target image regions as discussed at length by Schultz throughout sections 2 and 3. For example, on page 41, eq. 17 is an equation for "computing pixel values for the target image based on corresponding pixel value contributions from the base images selected in accordance with the motion classes assigned to the target image regions." The other equations in this section of Schultz are also used for "computing pixel values of the target image."

Clearly, Schultz computes pixel values because the entire purpose of the motion maps and motion vectors of Schultz is to "compute pixel values of the target image" as shown by the super resolution images in figures 1 and 2 and as shown by the equations for computing pixel values in section 2.

Although Schultz discloses assigning respective regions of a target image to motion classes, because each motion field of a compact block is a motion class assigned to a respective region, Schultz does not use the phrase "motion classes."

However, using motion classes is well known in the art, as taught by Paniconi, who discloses assigning respective regions of a target image to motion classes based on the computed motion maps (figure 2 block 202 computes a motion map and block 204 assigns regions to motion classes) and computing pixel values for the target image based on corresponding pixel value contributions from the base images selected in accordance with the motion classes assigned to the target image regions (column 2 lines 39-49, methods for motion segmentation can divide a frame into a number of motion classes, where each moving object is assigned to its own motion class. See also

figure 2). The purpose of performing motion estimation with motion classes is to compute pixel values for the target image based on corresponding pixel values (or "pixel value contributions") from other (or "base") images selected in accordance with the motion classes assigned to the target image regions, as taught by Paniconi in col. 1 lines 28-42. (See also the abstract, col. 2 lines 5-10, col. 3 lines 24-30 and lines 54-65, col. 7 lines 30-37, col. 8 lines 13-21, figures 2 and 4, and claims 1, 3, 4, 9 and 20).

The use of motion estimation to perform super resolution by "computing pixel values for the target image based on corresponding pixel value contributions from the base images selected in accordance with the motion [fields] assigned to the target image regions" is disclosed by Schultz as discussed above. An example of a motion estimation method used by Schultz's super resolution process is Mussman et al., "Advances in picture coding," *Proceedings of the IEEE* 73(4), 1985, 523-548 as discussed by Schultz on page 42. Schultz successfully applies Mussman's picture coding method to a super resolution process. Similarly, although Paniconi discloses a motion estimation method that was originally designed for a video coding process, it would have been obvious to one of ordinary skill in the art to use the motion estimation that includes the motion classes of Paniconi when performing the motion estimation in the super resolution enhancement algorithm of Schultz, because each motion class can be tracked across frames using vectors, which saves processing time as taught by Paniconi col. 2 lines 45-49.

The Supreme Court has held that in analyzing the obviousness of combining elements, a court need not find specific teachings, but rather may consider "the

background knowledge possessed by a person having ordinary skill in the art" and "the inferences and creative steps that a person of ordinary skill in the art would employ. *See KSR Int'l v. Teleflex, Inc.,* 127 S. Ct. 1727, 1740-41, 82 USPQ2d 1385, 1396 (2007). To be nonobvious, an improvement must be "more than the predictable use of prior art elements according to their established functions." *Id.* Here the combination is the predictable use of two known methods, one performed by the other, according to their established functions, to achieve their predictable results.

Specifically, Schultz discloses the known method of "computing pixel values for the target image based on corresponding pixel value contributions from the base images selected in accordance with the motion [estimates] assigned to the target image regions" and Paniconi discloses the known method of creating "motion classes assigned to the target image regions" when performing motion estimation. Therefore, the combination of "computing pixel values for the target image based on corresponding pixel value contributions from the base images selected in accordance with the motion classes assigned to the target image regions" yields a predictable result of using motion classes to improve the motion estimation part of a super resolution method.

For claim 2, Schultz discloses generating for each image pair respective dense motion vectors describing motion at pixel locations with respective sets of parameters in a motion parameter space at sub-pixel accuracy (the entire article starting with the title and ending with the conclusion discusses this claimed element).

For claims 3, 29 and 43, Paniconi discloses assigning pixels of the reference image to respective motion classes as discussed in the rejection of claim 1 and up-projecting the motion class assignments to pixels of the target image (see for example figures 1a, 1b and 1c which show classes projected to pixels, see also column 6 lines 1-24). Schultz also discloses up-projecting on page 45 first column ("Up-sample both low-resolution frames).

For claims 11, 32 and 46, Schultz discloses computing an alignment accuracy map for each pairing of the reference image and a respective neighboring image based on the computed motion maps (page 43, the displaced frame difference along with its mean and variance are computed to determine how well the motion vectors have been estimated).

For claim 16, Schultz discloses up-projecting the motion maps from the base image resolution level to the target image resolution level (see page 45, the up-sampled frames produce the up-sampled subpixel resolution motion vectors). Clearly the low resolution maps and motion vectors of the low resolution images in figures 1 and 2 are up-sampled to the resolution of the target image in order to generate the high resolution target image.

For claims 17, 37 and 51, Schultz discloses re-mapping the neighboring images to the reference frame of the up-projected reference image using the respective up-

projected motion maps (page 45, re-mapping is performed by computing the Bayesian multiframe HRVS for each motion field).

Claims 4-5, 30 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schultz and Paniconi as applied to claims 1-3 above, and further in view of U.S. Patent Number 6,269,175 issued to Hanna et al. ("Hanna").

For claims 4, 30 and 44, Paniconi discloses computing motion magnitude maps from each motion map (see columns 8-9 and figures 6a, 6b, 6c, 6d, 6e and 6f, although Paniconi does not use the words "motion magnitude maps," he clearly computes the motion magnitude map for each class from the motion map as shown for example in the discussion of figure 6c), Hanna discloses multiresolution image pyramid representations that can down-sample the computed motion magnitude maps of Paniconi to a pyramid of motion magnitude maps at respective resolution levels lower than the base resolution level, and segment pixels in the pyramid of down-sampled motion magnitude maps into motion classes.

It would have been obvious to one of ordinary skill in the art at the time of invention to include the multiresolution image pyramid resolutions with the image enhancement and segmenting methods of Schultz and Paniconi, because the pyramid resolutions provide the benefit of very efficient computation even when large displacements are present but also provide subpixel accuracy in displacement estimates as taught by Hanna at column 6 lines 40-50.

For claim 5, Paniconi discloses segmenting, and Hanna discloses iteratively estimating pixels in the pyramid of motion magnitude maps from a coarsest resolution level up to the base resolution level, wherein estimating from each coarser resolution level is up-sampled to initialize the estimation at a finer resolution level, and refined by further estimation at the finer resolution level.

Claims 6, 12-15, 31, 33-36, 45, 47-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schultz and Paniconi as applied to claims 1-3 above, and further in view of Eren et al., "Robust, Object-Based High-Resolution Image Reconstruction from Low-Resolution Video," published by IEEE Transactions on Image Processing, v 6 n 10, October 1997 ("Eren").

For claims 6, 31 and 45, Eren discloses generating a separate motion class segmentation map for each pairing of the reference image and a respective neighboring image and merging the separate motion class segmentation maps into a unified motion class segmentation map for the reference image (see pages 1448-49 and figures 1(a) and (e), the segmentation maps of each frame are given or can be computed, and the segmentation map of a reference frame is given. The maps are used to create a high resolution mosaic).

It would have been obvious to one of ordinary skill in the art at the time of invention to modify the enhancement methods of Schultz and Paniconi with the segmentation map of Eren to enable object based processing that uses more accurate

motion models and improves the quality of the reconstructed image as taught by Eren in the abstract.

For claims 12, 33 and 47, Eren discloses re-mapping neighboring images to a coordinate frame of the reference image using respective motion maps, and computing correlation measures between pixels of the reference image and pixels of each of the motion-compensated neighboring images (see section III robust high-resolution reconstruction using a validity map, the correlation measure is determined over a 3x3 window of pixels between the reference image and other low resolution images).

It would have been obvious to one of ordinary skill in the art at the time of invention to modify the enhancement methods of Schultz and Paniconi with the validity map of Eren to improve the quality of the image by using projections only for those pixel locations for which the motion vectors are accurate as taught by Eren.

For claims 13, 34 and 48, Eren discloses up-projecting the computed alignment accuracy maps from the base image resolution level to the target image resolution level as discussed in section III.

For claims 14, 35 and 49, Eren discloses up-projecting the motion maps from the base image resolution level to the target image resolution level, and classifying motion vectors in each up-projected motion map into valid and invalid motion vector classes

based on the up-projected alignment accuracy maps as disclosed throughout the entire document's discussion of the validity map.

For claims 15, 36 and 50, both Eren and Schultz disclose values of target image pixels with corresponding pixels in all neighboring images being associated with motion vectors in the invalid motion vector class are computed by interpolating up-projected pixel values of the reference image.

Claims 7-10, 18-27, 38-41, 52-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schultz, Paniconi and Eren as applied to claim 6 above, and further in view of U.S. Patent Numer 6,307,560 issued to Kondo et al. ("Kondo").

For claim 7, Paniconi discloses that reference image pixels are respectively assigned to a motion class. Kondo discloses that the motion class is selected from a motion class set including a high motion class and a low motion class, and motion vectors assigned to the high motion class have higher magnitudes than motion vectors assigned to the low motion class (column 5 lines 18-36).

It would have been obvious to one of ordinary skill in the art at the time of invention to include the low and high motion classes of Kondo with the motion classes of Paniconi for the benefit of varying the description of the motion according to the application as taught by Kondo in column 5 line 25.

For claim 8, Paniconi discloses assigning a given reference image pixel to the low motion class in the unified motion class segmentation map when the given pixel is assigned to the low motion class in all of the separate motion class segmentation maps, and assigning a given reference image pixel to the high motion class in the unified motion class segmentation map when the given pixel is assigned to the high motion class in any of the separate motion class segmentation maps (see figures 1a, 1b and 1c each object has its own class that is tracked over multiple frames).

For claim 9, Kondo discloses that the motion class set further includes an intermediate motion class, and motion vectors assigned to the intermediate motion class have magnitudes higher than motion vectors assigned to the low motion class and lower than motion vectors assigned to the high motion class (see column 5).

For claim 10, Kondo discloses assigning a given reference image pixel to the intermediate motion class (column 5) and Paniconi and Eren disclose the unified motion class segmentation map.

For claim 18, Paniconi discloses regions of the target image are respectively assigned to a motion class selected from a motion class set (abstract) and Kondo discloses the motion classes include a high motion class and a low motion class, and motion vectors of regions assigned to the high motion class have higher magnitudes than motion vectors of regions assigned to the low motion class (column 5)

For claims 19, 38 and 52, Eren suggests computing a pixel-wise combination of pixel value contributions from the up-projected reference image and the re-mapped neighboring images weighted based on pixel-wise measures of alignment accuracy between the reference image and the corresponding neighboring images (the validity map and blurring is accounted for to determine whether pixels are aligned and contribute).

For claims 20, 39 and 53, Eren suggests that pixel value contributions from the re-mapped neighboring images are additionally weighted based on measures of temporal distance between the reference image and the corresponding neighboring images (the temporal distance is accounted for using motion vectors and the segmentation maps).

For claims 21, 40 and 54 Eren suggests classifying low motion class reference image pixels and their corresponding pixels in the neighboring images based on measures of local texture richness (see page 1449 the background is low motion that is classified based on texture).

For claim 22, Eren and Paniconi suggest low motion class reference image pixels and their corresponding pixels in the neighboring images are quantitatively evaluated for local texture richness, and are classified into a texture class selected from the texture

class set including a high texture region class and a low texture region class, and pixels assigned to the high texture region class have higher local texture measures than pixels assigned to the low texture region class (see page 1448 of Eren and the abstract of Paniconi, the low motion classes can be segmented into low motion background and low motion object based on the textures).

For claim 23, Eren suggests values of target image pixels classified into the low texture region class in the reference image and all of the respective neighboring images, are computed by interpolating up-projected pixel values of the reference image (the pixel values of the background are determined from the reference image).

For claim 24, Eren and Paniconi suggest a value of a given target image pixel classified into the high texture region class in the reference image or any respective neighboring images is computed based on a pixel value contribution from the up-projected reference image, and a pixel value contribution from a given re-mapped neighboring image weighted based on a measure of local texture richness computed for the given pixel, a measure of motion estimation accuracy computed for the given pixel, and a measure of temporal distance of the neighboring image from the reference image (the pixel values of a moving object are determined from texture, motion, and temporal images).

For claims 25, 41 and 55, Eren discloses values of target image pixels are computed based on pixel value contributions from a number of base images neighboring the reference image, and Paniconi discloses the number of neighboring base images being different for different motion classes (if an object is moving faster than another object, it will usually be present in fewer base images before it moves out of the field of view).

For claim 26, the combination of Eren, Paniconi and Kondo suggests values of target image pixels assigned to the high motion class are computed based on pixel value contributions from a fewer number of neighboring base images than the values of target image pixels assigned to the low motion class (slower objects are present in more images than faster objects).

For claim 27, Kondo suggests an intermediate motion class, the motion vectors of regions assigned to the intermediate motion class have lower magnitudes than motion vectors of regions assigned to the high motion class and higher magnitudes than motion vectors of regions assigned to the low motion class, and values of target image pixels assigned to the intermediate motion class are computed based on pixel value contributions from a fewer number of neighboring base images than the values of target image pixels assigned to the low motion class but a higher number of neighboring base images than the values of target image pixels assigned to the high motion class.

(10) Response to Arguments

In response to appellant's argument on page 10 of the appeal brief that the "Examiner's assertions regarding Schultz' disclosure of the 'assigning' and 'computing' elements of claim 1 are premised on the Examiner's assertion that each motion vector disclosed on Schultz constitutes a respective motion class that is assigned to a respective region ... improperly conflates the 'motion classes' elements of claim 1 with the 'motion vectors' elements of claim 1, and, thereby, effectively reads the 'motion classes' elements out of the claim," nothing could be further from the truth. No "improper conflating" is occurring.

During patent examination, the pending claims must be "given their broadest reasonable interpretation consistent with the specification." MPEP 2111. The words of a claim are given their "plain meaning" because ordinary, "simple English words whose meaning is clear and unquestionable, absent any indication that their use in a particular context changes their meaning, are construed to mean exactly what they say." *Chef America Inc. v. Lamb-Weston, Inc.,* 358 F.3d 1371, 1372 (Fed. Cir. 2004).

Specifically, in the claim language, the term "motion class" is broad enough to encompass a group of pixels that are assigned to a motion vector. As appellant noted on page 14 of his appeal brief, the "pertinent definition of 'class' is 'a group, set, or kind sharing common attributes.'" Therefore, the pixels assigned to a motion vector form a "group, set, or kind sharing common attributes" of velocity and direction, which reads on the element "assigning respective regions of a target image to motion classes" as recited in claim 1.

The rest of appellant's arguments relating to the "assigning" element found in Schultz, found for example on pages 11 to 13 of the appeal brief, are discussing the actual language found in Schultz, and concluding that the actual language does not include the literal words "assigning respective regions of a target image to motion classes based on the computed motion maps, the target image having a target resolution level and the base images having a base resolution level equal to or lower than the target resolution level."

However, the motion vectors of Schultz form a motion map. The motion vectors are assigned to specific regions in accordance with the motion map. The pixels that are assigned to the motion vectors form motion classes in a manner that is consistent with the plain meaning of the English word "class" and with the meaning of the word "class" given by appellant on page 14 footnote 2 of the brief. The base images have a resolution lower than the target image. These elements are clearly shown throughout the entire article by Schultz, beginning with the title "Subpixel Motion Estimation for Super-Resolution Image Sequence Enhancement" and ending with the conclusion, as discussed in the rejection and as further discussed by appellant's citations of Schultz.

Nevertheless, the reference to Paniconi was added to the rejection because Paniconi clearly discloses the exceedingly obvious nature of motion classes.

In response to appellant's arguments on pages 13 and 14 of the brief that contrary "to the Examiner's position, Paniconi does not disclose 'assigning respective regions of a target image to motion classes based on the computed motion maps"

nothing is further from the truth. Specifically, Paniconi discusses motion classes in the abstract, in col. 1 lines 28-32, in col. 2 lines 5-10, in col. 3 lines 24-30 and lines 54-65, in col. 7 lines 30-37, in col. 8 lines 13-21, in figures 2 and 4, and in claims 1, 3, 4, 9 and 20.

Appellant cites portions of Paniconi that disclose exactly this feature then argues that Paniconi lacks this feature. The logic supporting appellant's conclusion is unclear at best. For appellant to argue that a reference which discloses "identifying separate classes of motion in a frame (col. 1 lines 28-30)" where "each motion class [has] at least one region classified thereto (col. 9 lines 50-52)" does not disclose "assigning respective regions of a target image to motion classes" is beyond comprehension.

In response to appellant's arguments that Schultz does not disclose the "computing pixel values" on page 14 of the brief, the entire point of Schultz's article is to compute pixel values. For example, the title of Schultz's article is "Subpixel Motion Estimation for Super-Resolution Image Sequence Enhancement," which means that the image resolution is enhanced by computing pixel values based on motion estimation, which includes motion classes assigned to regions as discussed above. Appellant's argument with respect to this point is unclear at best.

In response to appellant's arguments on page 15 of the brief that Paniconi does not disclose "computing pixel values for the target image based on corresponding pixel value contributions from the base images selected in accordance with the motion

classes assigned to the target image regions," Paniconi in cols. 1 and 2 discusses using motion classes to generate pixel values for a target image based on corresponding pixel value contributions from base images selected in accordance with the motion classes, where the base images have a resolution equal to the target resolution level. This reads on claim 1, because claim 1 recites that the base images have a resolution "equal to" the target resolution level, therefore, the claim reads on a conventional compression method such as that disclosed by Paniconi.

Nevertheless, the super resolution portion of this element (where the base images have a resolution "lower than" the target resolution level) is disclosed by Schultz and "the motion classes assigned to the target image regions" are disclosed by Paniconi. See for example the entire patent of Paniconi beginning with the title and ending with the claims.

In response to appellant's arguments against the references individually on pages 9-16, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In this case, Schultz discloses "computing pixel values for the target image based on corresponding pixel value contributions from the base images selected in accordance with the motion [estimation] assigned to regions of the target image" and Paniconi discloses motion estimation that includes "motion classes assigned to the target image regions." Therefore, the elements of the combination

"computing pixel values for the target image based on corresponding pixel value contributions from the base images selected in accordance with the motion classes assigned to the target image regions" are disclosed by the prior art.

However, if appellant desires to argue each reference separately, each reference by itself anticipates claim 1.

Paniconi by itself anticipates claim 1. To the extent that the base images have a resolution “equal to” the “target resolution level,” the claim is not limited to super resolution but rather includes the standard compression method disclosed by Paniconi. That is, Paniconi discloses "computing pixel values for the target image based on corresponding pixel value contributions from the base images selected in accordance with the motion classes assigned to the target image regions" where "the base images have a resolution equal to ... the target resolution level." See for example columns 1 and 2 which discuss using motion classes to generate pixel values for a target image based on corresponding pixel value contributions from base images selected in accordance with the motion classes, where the base images have a resolution equal to the target resolution level.

Schultz by itself anticipates claim 1. Schultz discloses computing a respective motion map for each pairing of a reference image and a respective image neighboring the reference image in a sequence of base images, each motion map comprising a set of motion vectors mapping reference image pixels to respective neighboring image pixels (page 38, motion vectors are estimated between video frames, where the

accuracy of the estimated motion fields has a direct influence on the quality of the high resolution video still image). Schultz discloses the target image having a target resolution level and the base images having a base resolution level equal to or lower than the target resolution level (abstract, a high resolution video still image is estimated from several low resolution frames). Schultz discloses assigning respective regions of a target image to motion classes based on the computed motion maps in section 3.2, which describes a block matching motion estimation process that creates a motion map for objects that move independently in image sequences, and assigns respective regions of the target image to motion classes based on the computed motion maps by determining separate motion fields (motion classes) for compact blocks (respective regions of the target image) in the image sequences. Schultz further discloses, in section 2, computing pixel values for the target image based on corresponding pixel value contributions from the base images selected in accordance with the motion classes assigned to the target image regions. In other words, the super resolution images that are created by Schultz's method are created by pixel value contributions from other images selected in accordance with the motion classes (such as motion fields and motion vectors) assigned to the target image regions (such as compact blocks) as discussed at length by Schultz throughout section 3.

Nevertheless, even though Paniconi and Schultz each individually anticipate claim 1, in order to advance prosecution the superresolution element of “a base resolution level ... lower than the target resolution level” and the element of "computing pixel values for the target image based on corresponding pixel value contributions from

the base images selected in accordance with the motion classes assigned to the target image regions" have been addressed by the combination of references.

In response to appellant's argument on pages 16-18 of the brief that there is no suggestion to combine the references, The Supreme Court has held that in analyzing the obviousness of combining elements, a court need not find specific teachings, but rather may consider “the background knowledge possessed by a person having ordinary skill in the art” and “the inferences and creative steps that a person of ordinary skill in the art would employ. *See KSR Int'l v. Teleflex, Inc.,* 127 S. Ct. 1727, 1740-41, 82 USPQ2d 1385, 1396 (2007). To be nonobvious, an improvement must be "more than the predictable use of prior art elements according to their established functions." *Id.* Here the combination is the predictable use of two known methods, one performed by the other, according to their established functions, to achieve their predictable results. In this case, Schultz discloses the known method of "computing pixel values for the target image based on corresponding pixel value contributions from the base images selected in accordance with motion [estimates] assigned to the target image regions" and Paniconi discloses the known method of motion estimation that creates "motion classes assigned to the target image regions." Therefore, the combination of "computing pixel values for the target image based on corresponding pixel value contributions from the base images selected in accordance with the motion classes assigned to the target image regions" yields a predictable result.

With respect to appellant's arguments for the dependent claims on pages 18-32 of the appeal brief, appellant merely asserts that the literal claim language is not found in the references, while ignoring the concept disclosed by the references. Although the literal words of the dependent claims are not in the references, the scope of the claims that is defined by the words of the claims is in fact disclosed in the references as discussed in the rejections of the dependent claims.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Jeffrey Smith

July 3, 2008

Conferees:

/Jingge Wu/

Supervisory Patent Examiner, Art Unit 2624

/Brian P. Werner/

Supervisory Patent Examiner, Art Unit 2624